CLAIMS

What is claimed is:

1. An ultrasonic medical device comprising:

a catheter having a proximal end, a distal end and a plurality of fenestrations along a longitudinal axis of the catheter; and

an ultrasonic probe inserted into the catheter, the ultrasonic probe having a proximal end, a distal end and a longitudinal axis therebetween,

wherein the catheter delivers a pharmacological agent to dissolve an occlusion and the ultrasonic probe vibrates in a transverse mode to ablate the occlusion along a portion of the longitudinal axis of the ultrasonic probe and a probe tip.

2. The ultrasonic medical device of claim 1 wherein the plurality of fenestrations are spaced circumferentially along the catheter.

3. The ultrasonic medical device of claim 1 wherein the plurality of fenestrations are located at the distal end of the catheter.

4. The ultrasonic medical device of claim 1 wherein the occlusion comprises a biological material.

5. The ultrasonic medical device of claim 1 wherein the pharmacological agent softens the occlusion.

6. The ultrasonic medical device of claim 1 wherein the pharmacological agent moves in a radial direction through the plurality of fenestrations.

7. The ultrasonic medical device of claim 1 wherein the pharmacological agent is a tissue plasminogen activator.

8. The ultrasonic medical device of claim 1 wherein the pharmacological agent is selected from a group consisting of thrombolytic agents, antiplatelet drugs, lysing agents, anticoagulants and similar agents that treat the occlusion.

9. The ultrasonic medical device of claim 1 wherein the pharmacological agent is selected from a group consisting of aspirin, dipyridamole, glycoprotein inhibitors, thienopyrindines, clopidogrel, hirudin, urokinase, streptokinase, heparin, warfarin and similar agents that treat the occlusion.

10. The ultrasonic medical device of claim 1 wherein a transverse ultrasonic vibration of the ultrasonic probe produces a plurality of transverse nodes and a plurality of transverse anti-nodes along a portion of the longitudinal axis of the ultrasonic probe.

11. The ultrasonic medical device of claim 1 wherein the ultrasonic probe ablates the occlusion adjacent to a plurality of transverse anti-nodes along the portion of the longitudinal axis of the ultrasonic probe.

12. The ultrasonic medical device of claim 1 wherein the ultrasonic probe is disposable.

13. The ultrasonic medical device of claim 1 wherein the ultrasonic probe is for a single use on a single patient.

14. An ultrasonic medical device for destroying a biological material comprising:

a catheter having a proximal end, a distal end and a plurality of fenestrations along a longitudinal axis of the catheter;

an ultrasonic probe inserted into the catheter; and

a pharmacological agent delivered through the catheter to enhance a biological material destroying effect of the ultrasonic probe vibrating in a transverse mode along a portion of a longitudinal axis of the ultrasonic probe and a probe tip.

15. The ultrasonic medical device of claim 14 wherein the pharmacological agent moves through an open area between the ultrasonic probe and the catheter.

16. The ultrasonic medical device of claim 14 wherein the pharmacological agent moves in a radial direction through the plurality of fenestrations along the catheter.

17. The ultrasonic medical device of claim 14 wherein the plurality of fenestrations are spaced circumferentially along the catheter.

18. The ultrasonic medical device of claim 14 wherein the pharmacological agent is a tissue plasminogen activator.

19. The ultrasonic medical device of claim 14 wherein the pharmacological agent is selected from a group consisting of thrombolytic agents, antiplatelet drugs, lysing agents, anticoagulants and similar agents that treat the biological material.

20. The ultrasonic medical device of claim 14 wherein the pharmacological agent is selected from a group consisting of aspirin, dipyridamole, glycoprotein inhibitors, thienopyrindines, clopidogrel, hirudin, urokinase, streptokinase, heparin, warfarin and similar agents that treat the biological material.

21. The ultrasonic medical device of claim 14 wherein a transverse ultrasonic vibration of the ultrasonic probe produces a plurality of transverse nodes and a plurality of transverse anti-nodes along a portion of the longitudinal axis of the ultrasonic probe.

22. The ultrasonic medical device of claim 14 wherein the ultrasonic probe destroys the biological material adjacent to a plurality of transverse anti-nodes along the portion of the longitudinal axis of the ultrasonic probe.

23. The ultrasonic medical device of claim 14 wherein more than one of the plurality of transverse anti-nodes are in communication with the biological material.

24. The ultrasonic medical device of claim 14 wherein the pharmacological agent dissolves the biological material.

25. A method of ablating a biological material comprising:

delivering a catheter into a vasculature;

inserting an ultrasonic probe into the catheter, the ultrasonic probe having a proximal end, a distal end and a longitudinal axis therebetween;

releasing a pharmacological agent through the catheter, the pharmacological agent moving through a plurality of fenestrations located along the catheter to dissolve the biological material;

extending a section of the longitudinal axis of the ultrasonic probe beyond a distal end of the catheter; and

activating an ultrasonic energy source coupled to the ultrasonic probe to generate an ultrasonic energy that produces a transverse ultrasonic vibration of the ultrasonic probe; and

ablating the biological material adjacent to the section of the longitudinal axis of the ultrasonic probe and a probe tip.

26. The method of claim 25 wherein the pharmacological agent and the ultrasonic probe work in combination to ablate the biological material.

27. The method of claim 25 further comprising pushing the section of the longitudinal axis of the ultrasonic probe beyond the distal end of the catheter.

28. The method of claim 25 further comprising pulling back the catheter to extend the section of the longitudinal axis of the ultrasonic probe beyond the distal end of the catheter.

29. The method of claim 25 further comprising engaging the pharmacological agent to the biological material and moving the pharmacological agent downstream from the biological material.

30. The method of claim 25 wherein the pharmacological agent is localized at the biological material.

31. The method of claim 25 further comprising breaking up the biological material into a particulate with a combination of the ultrasonic energy from the ultrasonic probe and the pharmacological agent.

32. The method of claim 31 further comprising breaking up the particulate into an aggregate with a combination of the ultrasonic energy and the pharmacological agent.

33. The method of claim 25 further comprising producing a plurality of transverse nodes and a plurality of transverse anti-nodes along the section of the longitudinal axis of the ultrasonic probe.

34. The method of claim 25 further comprising ablating the biological material adjacent to a plurality of transverse anti-nodes along the section of the longitudinal axis of the ultrasonic probe.

35. The method of claim 25 wherein the pharmacological agent is a tissue plasminogen activator.

36. The method of claim 25 wherein the pharmacological agent is selected from a group consisting of thrombolytic agents, antiplatelet drugs, lysing agents, anticoagulants and similar agents that treat the occlusion.

37. The method of claim 25 wherein the pharmacological agent is selected from a group consisting of aspirin, dipyridamole, glycoprotein inhibitors, thienopyrindines, clopidogrel, hirudin, urokinase, streptokinase, heparin, warfarin and similar agents that treat the occlusion.

38. A method of destroying a biological material comprising:

delivering a catheter into a vasculature;

inserting an ultrasonic probe into the catheter, the ultrasonic probe having a proximal end, a distal end and a longitudinal axis therebetween;

releasing a pharmacological agent through a plurality of fenestrations along the catheter to dissolve the biological material;

exposing a section of the longitudinal axis of the ultrasonic probe; and

activating an ultrasonic energy source coupled to the ultrasonic probe to generate an ultrasonic energy; and

vibrating in a transverse mode at least the section of the longitudinal axis of the ultrasonic probe and a probe tip to destroy the biological material.

39. The method of claim 38 further comprising pushing the section of the longitudinal axis of the ultrasonic probe beyond a distal end of the catheter.

40. The method of claim 38 further comprising pulling back on the catheter to expose the section of the longitudinal axis of the ultrasonic probe beyond a distal end of the catheter.

41. The method of claim 38 further comprising producing a plurality of transverse nodes and a plurality of transverse anti-nodes along the section of the longitudinal axis of the ultrasonic probe.

42. The method of claim 38 further comprising ablating the biological material adjacent to a plurality of transverse anti-nodes along the section of the longitudinal axis of the ultrasonic probe.

43. The method of claim 38 further comprising breaking up the particulate into an aggregate with a combination of the ultrasonic energy and the pharmacological agent.